

corridors; and escape, nesting, and thermal cover for wildlife. As many as 147 bird species, nesters, or winter visitants, as well as 55 species of mammals, are known to use this habitat type within this Ecological Management Zone.

Sloughs and ponds within and adjacent to wetlands in the San Joaquin Valley are important habitat for waterfowl, as well as many plant and wildlife species. They include many rare or declining species that have special status, such as being listed under the State or federal Endangered Species Acts (ESA).

Marshes, once the most widespread habitat in the San Joaquin Valley floodplain, are now restricted to remnant patches. There have been extensive fresh emergent wetland habitat losses to agricultural development. Most of the remaining wetlands lack adjacent upland transition habitat and other attributes of fully functioning wetlands because of agricultural practices. Emergent wetland habitat provides important habitat for many species of plants, waterfowl, and wildlife. In addition, wetlands contribute important plant detritus and nutrient recycling to the aquatic foodweb of the San Joaquin River and Bay-Delta estuary, as well as important habitat to some species of fish and aquatic invertebrates.

Seasonal wetlands include portions of the floodplain that seasonally flood, usually in winter and spring, especially in high flow years. Most of this habitat is located in the valley floor adjacent to the San Joaquin River and nearby perennial wetlands. Such habitats were once very abundant during the winter rainy season or after seasonal flooding. With reclamation (draining wetlands for other uses), flooding occurs primarily from accumulation of rainwater behind levees, directed overflow of flood waters to bypasses, or flooding leveed lands (e.g., managed wetlands). Seasonal wetlands are important habitat to many species of fish, waterfowl, shorebirds, and other wildlife.

Upland habitats are found on the outer edges of valley wetlands and consist primarily of grasslands and remnant oak woodland and oak savanna. Of these, perennial grasslands are an important transition habitat for many wildlife species. They act as buffers to protect wetland and riparian habitats. Much of the grassland habitat associated with wetland and riparian habitat has been lost to

agriculture (e.g., pasture, grain, vineyards, and orchards) and development (e.g., home construction, golf courses). Grasslands provide habitat for many plant and animal species.

Riparian habitat, both forest and shrub, is found on the water and land side of levees and along stream channels of the zone. This habitat ranges in value from disturbed (i.e., sparse, low value) to relatively undisturbed (i.e., dense, diverse, high value). The highest value riparian habitat has a dense and diverse canopy structure with abundant leaf and invertebrate biomass. The canopy and large woody debris in adjacent aquatic habitat provide shaded riverine aquatic (SRA) habitat on which many important fish and wildlife species depend during some portion of their life cycles. The lower value riparian habitat is frequently mowed, disced, or sprayed with herbicides, resulting in a sparse habitat structure with low diversity. Riparian habitat along intermittent streams is lost to excessive erosion and livestock grazing. Riparian habitat is used by more wildlife than any other habitat type. From about 1850 to the turn of the century, most of the riparian forests in the Central Valley were decimated for fuelwood as a result of the gold rush, river navigation, and agricultural clearing. Remnant patches are found on levees, along stream channels, and along the margins of marshes. Riparian habitats and their adjacent SRA habitat benefit fish and wildlife species.

Agricultural habitats also support populations of small animals, such as rodents, reptiles, and amphibians, and provide opportunities for foraging raptors (soaring birds of prey). Nonflooded fields and pastures are also habitat for pheasants, quail, and doves. The marshes along the Valley floor support a variety of wintering and breeding raptors. Preferred habitat consists of tall trees for nesting and perching near open agricultural fields, which support small rodents and insects for prey. Both pasture land and alfalfa fields support abundant rodent populations. The Swainson's hawk, a raptor species listed by the State as threatened, breeds and occasionally winters in the Central Valley.

Stressors to ecological processes, habitats, and species within this zone include land uses, such as urban and industrial development; water diversions; land reclamation; water conveyance

structures; livestock grazing; exotic (non-native) species; gravel mining; contaminants; wildfire, levees; bank protection; stream channelization; irrigation canals; and agricultural practices. These stressors have contributed to a change in native plant communities, fragmentation of riparian habitats, and interrupted migration corridors for species, such as the State and federally listed San Joaquin kit fox. Streamflows patterns and natural stream meandering have been altered by many of these stressors.

There are increased amounts and concentrations of contaminants in the San Joaquin River. Agricultural drainage and associated contaminants that originate in the West San Joaquin Basin Ecological Management Zone, or are transported to this Ecological Management Zone from agricultural lands to the south in the Westlands Subarea, are a significant source of contaminants reaching the Bay-Delta.

Other stressors include dams, reservoirs, and other structures. They have further contributed to habitat fragmentation and are barriers to wildlife movement and dispersal.

Water diversions from streams and adjacent marshes divert streamflow that is important to habitat and species of the zone. Diverted water is used primarily locally.

Toxins continue to enter the streams and adjacent marshes in large amounts from municipal, industrial, and agricultural discharges. The toxins have had a demonstrated effect on the health, survival, and reproduction of waterfowl, fish, and wildlife.

The riparian zones of west San Joaquin Valley streams are typical habitat of the California red-legged frog. Loss of riparian and adjacent upland habitats have led to declining frog populations in this zone and elsewhere in the Central Valley. Non-native predatory fish, such as largemouth bass in Central Valley ponds have also contributed to the decline of the frog.

Neotropical migratory birds depend on the riparian corridors of the creeks and wetlands of the San Joaquin Valley. Conversions of vegetative cover by agricultural practices and loss of riparian habitats, along with competition and predation by non-native species, have reduced populations of these migrants.

The San Joaquin Valley, with its wetland complexes, is an important waterfowl area. Large numbers of ducks, geese, and swans winter in the Valley, depending on the high-quality foraging habitat of the wetlands and adjacent riparian, upland, and agricultural habitats to replenish their energy reserves.

LIST OF SPECIES TO BENEFIT FROM RESTORATION ACTIONS IN THE WEST SAN JOAQUIN BASIN ECOLOGICAL MANAGEMENT ZONE

- native resident fishes
- neotropical migrant birds
- California red-legged frogs and other native anuran amphibians,
- native resident fishes,
- upland game,
- plant community groups, and
- waterfowl.

VISION FOR THE ECOLOGICAL MANAGEMENT ZONE

The vision for the West San Joaquin Basin Ecological Management Zone includes improved water quantity and quality from the basin to wetlands and the San Joaquin River. The vision also includes a range of sustainable aquatic, wetland, riparian, and upland habitats that support abundant natural production of resident fish and wildlife, as well as waterfowl and other migrant birds that use the Pacific Flyway each winter. The vision includes enlarging remaining native habitats and connecting those areas.

The vision focuses on improving watershed, stream channel, and floodplain processes. The result would be increased seasonal flows of quality water to the San Joaquin River and area wetlands and reduced input of agricultural waste runoff and associated contaminants into zone watersheds and wetlands and the San Joaquin River. Improved quality and quantity of water for publicly and privately managed wetlands will reduce stresses on waterfowl populations. Improved water quality and quantity in the San Joaquin River will directly

benefit fish and wildlife of the San Joaquin River and the Bay-Delta.

The ERP will focus on habitat restoration and water quality improvements in the southern and eastern portions of this zone. A particular focus is agricultural drainage that contains extremely high selenium concentrations. Selenium is present in such high concentrations in some areas that there are potential human and wildlife health problems. Seasonal wetlands for migratory species, such as waterfowl and shore birds, should be expanded and improved. Present restoration efforts can be expanded by providing adequate high quality water to the seasonal wetlands. Water supplies can be improved by reducing or eliminating diversions in streams and sloughs that flow into agricultural lands. Restoring natural watershed, stream, and floodplain processes on west side tributaries to the San Joaquin River, including Mud and Salt sloughs, Orestimbe Creek, and Los Banos Creek, will promote natural habitat restoration. Emphasis should also be placed on connecting habitats and providing unbroken habitat corridors necessary for species such as the San Joaquin kit fox, kangaroo rats, waterfowl, and neotropical birds.

Throughout much of the northern portion of the zone are numerous intermittent creeks and streams. Restored, they would provide higher quality water and improved habitats. Excluding cattle along the streams and creeks, removing gravel mining, and reducing diversions would improve stream channels and riparian corridors. Reforestation of sycamores has not been possible, because cattle range through the creek bottoms and landowners are continuously moving the rock beds around to pool water for the cattle during the summer months, when surface flows are minimal.

The narrow strips of grasslands along the California Aqueduct and Delta-Mendota Canal are managed intensively to suppress wildfires and erosion. The adjacent tributaries or drainages are also managed for vegetation control to increase the runoff into the conveyance systems. Practices should be modified to benefit species such as the San Joaquin kit fox, kangaroo rats, California red-legged frog, and native plants, such as perennial grasses. Alternatives to pesticides should be developed, or pesticides eliminated. This would encourage natural recovery of predator species like the kit fox, which help keep pest

species in balance, while reducing contaminants entering the system. Vegetation control practices should also be modified to support the recovery of native plants, such as perennial grasses and wetland species in the local watersheds.

Extensive wetland areas in the eastern portions of the zone adjacent to the San Joaquin River should be protected and expanded. Stream flow into the wetland-slough complexes should be improved. Water quality should also be improved. Natural floodplain processes should be enhanced through setback levees, stream meanders, and seasonal flood overflow basins, which should reduce peak flood flows to the San Joaquin River.

VISIONS FOR ECOLOGICAL PROCESSES

CENTRAL VALLEY STREAMFLOW: Where possible, natural streamflows will be protected, enhanced, and restored to support riparian habitat and important species.

NATURAL FLOODPLAIN AND FLOOD PROCESSES: Where possible, natural floodplain processes will be preserved by allowing winter-spring flows to overflow into riparian and wetland habitats. Natural stream meanders will be encouraged by removing, where possible, constraints on meander belts, such as levees and bank protection. Natural floodplain overflow will help to collect floodwaters and sediment and dissipate the erosive forces of flood waters.

VISIONS FOR HABITATS

RIPARIAN AND RIVERINE AQUATIC HABITATS: Riparian habitat, both forest and shrub, will be protected and expanded along zone streams and wetlands. Remnant patches of high-quality riparian habitat will be protected. Disturbed habitat will be restored, where possible. Agricultural and grazing practices will be modified in riparian zones to encourage riparian and SRA habitat recovery along streams. Improvements in stream flows will also benefit riparian zones.

NONTIDAL PERENNIAL AQUATIC HABITAT: Existing sloughs and ponds within and adjacent to wetlands in the San Joaquin Valley will be protected and new aquatic habitat created.

EMERGENT WETLAND HABITAT: Remnant patches of marshlands will be expanded and connected, where possible. New wetlands will be created.

SEASONAL WETLAND HABITAT: Existing seasonal flooding areas will be protected and sources of water maintained or expanded to promote higher quality wetlands, especially in drier years. Areas where seasonal flooding develops, seasonal wetlands will be expanded.

PERENNIAL GRASSLANDS: Upland habitats around the outer edges of wetlands will be protected and expanded. Grasslands and remnant oak woodland and oak savanna will be restored, where possible.

FRESHWATER FISH HABITAT: Freshwater fish habitat is an important component needed to ensure the sustainability of resident native fish species. The streams in the West San Joaquin Basin Ecological Management Zone are typical California roach streams that are small, mid-elevation stream that typically contain deep pools in canyons and are often intermittent in flow by late summer (Moyle and Ellison 1991).

AGRICULTURAL LANDS: Agricultural practices that provide valuable wildlife habitat will be encouraged. Riparian and upland habitats will be protected and expansion encouraged.

VISIONS FOR REDUCING OR ELIMINATING STRESSORS

WATER DIVERSIONS: Water diversions along valley streams and adjacent marshes will be reduced, where possible and needed, to protect and enhance riparian and wetland habitats. Greater streamflows, especially in drier years, will provide for expanded riparian habitat.

CONTAMINANTS: Reduced input of toxins to valley streams and wetlands will improve health, survival, and reproduction of many important waterfowl and other wildlife. Reduced toxins also will reduce contaminant effects on fish and wildlife in the San Joaquin River and the Bay-Delta. Levels of toxins in the fish tissues should be reduced.

VISIONS FOR SPECIES

RESIDENT NATIVE FISH SPECIES: Many native fish species will benefit from improved aquatic habitats and stream channel/floodplain processes. Population abundance indices should remain stable or increase and population sizes should be large enough fully to recover from natural and human-induced disasters. The distribution of native resident fishes should increase with widespread habitat restoration.

NEOTROPICAL MIGRANT BIRDS: Protection, restoration, and enhancement of large, contiguous areas of riparian and wetland habitats that contain a great diversity in composition, density, and make-up will benefit the recovery of listed neotropical migrants such as yellow-billed cuckoo as well as aid in the prevention of future listing of additional bird species.

CALIFORNIA RED-LEGGED FROG: Protection, restoration, and enhancement of the zone streams and associated riparian and upland habitats will benefit the recovery of the red-legged frog. Efforts to manage invasive species such as the bullfrog will also be carried out, where necessary, to benefit the recovery as well.

WESTERN POND TURTLE: The vision for the western pond turtle is to maintain the abundance and distribution of this California species of special concern in order to contribute to the overall species richness and diversity. Protecting existing and restoring additional suitable wetland and upland habitats will be critical to achieving recovery of the western pond turtle.

NATIVE ANURAN AMPHIBIANS: The vision for the native anuran species is to stop habitat loss and the introduction of other species that prey on the different life stages of these amphibians. Ongoing surveys to monitor known populations and find additional populations is essential to gauge the health of the species in this group. To stabilize and increase anuran populations, non-native predator species should be eliminated from historic habitat ranges. Increasing suitable habitat and maintaining clean water supplies that meet the needs of the various species in this group is essential.

WATERFOWL: Protection, restoration, and enhancement of wetland complexes and beneficial agricultural habitats with adjacent upland habitats will improve waterfowl use.

PLANT SPECIES AND COMMUNITIES: The vision for plant species and communities is to protect and restore these resources in conjunction with efforts to protect and restore wetland and riparian and riverine aquatic habitats.

VALLEY ELDERBERRY LONGHORN BEETLE: The vision for the valley elderberry longhorn beetle is to recover this federally listed threatened species by increasing its populations and abundance through restoration of riparian systems.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

Much of the vision for the West San Joaquin Valley can be accomplished through cooperative efforts of landowners, agencies, and other stakeholders. Watershed conservancy organizations should be established to structure such cooperative efforts. Funding and technical support should be provided to these conservancies to oversee and conduct much of the restoration work.

Some lands marginal for agriculture because of poor drainage can be purchased from willing sellers for conversion to wildlife habitat. Incentive plans should be developed to allow land owners to maintain their lands and habitats consistent with the vision. Agricultural management plans that are more friendly to wildlife, because studies have shown that soil productivity can be increased by leaving land out of production for extended periods. Such practices, programs, and efforts can restoring blocks of wildlife habitat for relatively long periods of time while enhancing crop production and lessening the need for fertilizers and chemicals. Incentives should be developed to encourage landowners maintain at least 10% of their land as fallow or non-agriculture. Additional incentives should be offered to land owners to convert portions of their lands to natural habitats permanently. This would effectively reduce the stress of land use practices and the use of contaminants and improve wildlife habitat. An additional incentive program might entail livestock enclosures to protect stream banks and allow sycamores and opportunity to regenerate.

Much of the vision can be accomplished through established restoration programs on federal and State lands, as well as on private lands. The Southern San Joaquin Valley Ecosystems Protection Program was initiated in 1986 to provide a foundation for planning now to protect future ecosystems and sensitive species in the Southern San Joaquin Valley. This program identifies opportunities to protect and to restore the connectivity of the remaining natural habitat. The San Joaquin Drainage Implementation Program is similar.

NONGAME MIGRATORY BIRD HABITAT CONSERVATION PLAN

The U.S. Bureau of Land Management administers a habitat conservation plan for nongame migratory birds. Recommendations are provided; however, no funding is presently available.

CENTRAL VALLEY HABITAT JOINT VENTURE

The Central Valley Habitat Joint Venture is a component of the North American Waterfowl Management Plan of the USFWS with funding and cooperative projects of federal, State, and private agencies. New sources of funding including CALFED restoration funds are being sought to implement the joint venture. The joint venture has adopted an implementation plan that includes the west side of the San Joaquin Valley. Objectives include protection of wetlands through acquisition of in-fee title or conservation easements, and enhancement of waterfowl habitat in wetlands and agricultural lands. The objectives and targets of the joint venture have been adopted by the ERP.

MANAGEMENT PLAN FOR AGRICULTURAL SUBSURFACE DRAINAGE AND RELATED PROBLEMS ON THE WESTSIDE SAN JOAQUIN VALLEY

This plan is a framework for reducing impacts of contamination by agricultural drainage water. The plan was prepared by the California Resources Agency, DWR, Reclamation, USFWS, and USGS.

SAN JOAQUIN RIVER MANAGEMENT PLAN

State Assembly Bill 3606 authorizes the San Joaquin River Management Plan to identify factors adversely affecting the San Joaquin River and its tributaries. Problems being considered are flood protection, water supply, water quality, recreation, and fish and wildlife. Emphasis is on a plan to restore and manage riparian corridors, floodways, non-native vegetation removal, wetland restoration, and basin water quality. The plan was developed by DWR and is administered by the San Joaquin River Parkway and Conservation Trust.

LINKAGE TO OTHER — ECOLOGICAL MANAGEMENT ZONES

Many of the habitats, processes, and stressors found within this Ecological Management Zone are similar to those found in the Fresno Slough/Mendota Basin Subregion, and East San Joaquin Ecological Management Zone. Efforts within one Ecological Management Zone should be similar to those in adjacent zones providing connectivity where needed and cumulative benefits to the system.

RESTORATION TARGETS AND PROGRAMMATIC ACTIONS

ECOLOGICAL PROCESSES

CENTRAL VALLEY STREAMFLOWS

TARGET 1: Provide flows of suitable quality water that more closely emulate (imitate) natural annual and seasonal streamflow patterns in West San Joaquin tributary watersheds. Provide a total watershed flow of 250 to 500 cfs to the San Joaquin River in dry and normal years for a 10-day period in late April to early May (approximately 5,000 to 10,000 af) (◆).

PROGRAMMATIC ACTION 1A: Enter into agreements with water districts and wetland managers to provide return flows of high quality water from irrigated agriculture and seasonal wetlands to the San Joaquin River.

PROGRAMMATIC ACTION 1B: Enter into agreements with landowners and water districts to

limit diversions of natural flows from streams to improve streamflows.

PROGRAMMATIC ACTION 1C: Make seasonal releases from the California Aqueduct or Delta-Mendota Canal into streams and wetlands.

PROGRAMMATIC ACTION 1D: Limit capture of natural stream flows from westside tributaries into irrigation canals and ditches and State and federal aqueducts.

RATIONALE: The proposed supplemental flows were selected as a representative value for impact analysis in the Programmatic EIS/EIR. Throughout the ERP, the need to determine optimal streamflow for ecological processes, habitats, and species is repeated. The issues of supplemental flows are complex in term of ecosystem improvements. The frequency, magnitude, duration, timing and rate of change of streamflows that form channels, create and maintain riparian habitat (including all species of vegetation), and promote all life stages of the various aquatic species dependent on a particular stream will never occur within a single year. An optimal flow regime will have to vary, perhaps significantly, from year to year. The supplemental flow recommendations will be an intensive exercise in adaptive management and must be based on credible scientific underpinnings.

Natural streamflow patterns are important in maintaining geomorphology of watersheds, as well as riparian and floodplain vegetation along stream banks. Streamflow is also essential for the well being of valley wetlands and contributes to the flow of the San Joaquin River and to Delta inflow.

NATURAL FLOODPLAIN AND FLOOD PROCESSES

TARGET 1: Restore 10 to 25 miles of stream channel, stream meander belts, and floodplain processes along westside tributaries of the San Joaquin River (◆◆).

PROGRAMMATIC ACTION 1A: Enter into agreements with willing landowners and irrigation districts to set back levees and allow floodplain processes such as stream meander belts.

PROGRAMMATIC ACTION 1B: Expand existing floodplain overflow basins by obtaining easements of titles from willing sellers of floodplain lands.

PROGRAMMATIC ACTION 1C: Reduce or eliminate gravel mining and stream bed altering from active stream channels.

RATIONALE: *Restoring natural stream channel and floodplain processes will help restore natural habitat and vegetation.*

HABITATS

NONTIDAL PERENNIAL AQUATIC HABITAT

TARGET 1: Evaluate the feasibility of restoring 1,000 acres of perennial aquatic habitat within and adjacent to existing wetlands (◆◆).

PROGRAMMATIC ACTION 1A: Manage existing wetlands so that they maintain 40 percent open water and 60 percent vegetation.

RATIONALE: *Aquatic habitats provide valuable foraging and resting habitats for waterfowl.*

FRESH EMERGENT WETLAND HABITAT

TARGET 1: Evaluate the feasibility of restoring or creating fresh emergent wetland habitat (◆).

PROGRAMMATIC ACTION 1A: Develop a cooperative program to acquire, in-fee title or through a conservation easement, the land needed for tidal restoration, and complete the needed steps to restore the wetlands.

RATIONALE: *Aquatic habitats provide valuable foraging and resting habitat for waterfowl and habitat for a variety of special status species.*

PERENNIAL GRASSLAND HABITAT

TARGET 1: Evaluate the feasibility of preserving and restoring perennial grassland habitats (◆).

PROGRAMMATIC ACTION 1A: Develop a cooperative program to restore perennial grasslands by acquiring conservation easements or purchasing land from willing sellers.

RATIONALE: *Restoring wetland, riparian, and adjacent upland habitats in association with aquatic habitats is an essential element of the restoration*

strategy for this Ecological Management Zone. Eliminating fragmentation and restoring connectivity will enhance habitat conditions for special-status species.

SEASONAL WETLAND HABITAT

TARGET 1: Evaluate the feasibility of creating or improving seasonal wetland habitats (◆).

PROGRAMMATIC ACTION 1A: Acquire lands adjacent to existing seasonal wetlands from willing sellers or conservation easements.

TARGET 2: Provide 150,000 af of water to existing wetlands to improve waterfowl habitat (◆).

PROGRAMMATIC ACTION 2A: Provide water to wetlands on a seasonal basis from the California Aqueduct, Delta-Mendota Canal, or other source.

RATIONALE: *Improved seasonal wetland habitat will provide additional seasonal habitat for waterfowl.*

RIPARIAN AND RIVERINE AQUATIC HABITATS

TARGET 1: Restore 5 miles of riparian habitat totaling 500 to 1,000 acres (◆◆).

PROGRAMMATIC ACTION 1A: Restore riparian forest habitat on lands purchased from willing sellers or obtained via conservation easements.

RATIONALE: *Additional riparian forest habitat would improve habitat for many special status plant and animal species.*

FRESHWATER FISH HABITAT

TARGET 1: Maintain and improve existing freshwater fish habitat through the integration of actions described for ecological processes, habitats, and stressor reduction or elimination (◆◆).

PROGRAMMATIC ACTIONS: No additional programmatic actions are recommended.

RATIONALE: *Freshwater fish habitat is evaluated in terms of its quality and quantity. Actions described for West San Joaquin Basin Ecological Management Zone ecological processes, stressor reduction, and riparian and riverine aquatic habitat*

should suffice to maintain and restore freshwater fish habitats. For example, maintaining freshwater fish habitats is governed by actions to maintain streamflow, improve coarse sediment supplies, maintain stream meander, maintain or restore connectivity of the rivers in this ecological management zone and their floodplains, and in maintaining and restoring riparian and riverine aquatic habitats.

AGRICULTURAL LANDS

TARGET 1: Restore and maintain migration corridors of native plants of more than one mile in width (◆).

PROGRAMMATIC ACTION 1A: Purchase land or conservation easements on which to restore wildlife habitat to connect existing grassland or agricultural wildlife habitat.

RATIONALE: Corridors of habitat are necessary between larger habitat areas to ensure potential recovery of kit fox populations in the San Joaquin Valley.

STRESSORS

CONTAMINANTS

TARGET 1: Evaluate the feasibility of reducing the application of herbicides, pesticides, fumigants, and other agents toxic to fish and wildlife on 20,000 acres of agricultural lands that have the greatest risk to fish and wildlife populations (◆).

PROGRAMMATIC ACTION 1A: Acquire land from willing sellers in areas with demonstrated subsurface agricultural drainage problems and elevated levels of selenium and return those lands to native alkaline scrub habitat.

PROGRAMMATIC ACTION 1B: Enter into conservation easements with willing landowners to modify agricultural practices in ways to reduce loads and concentrations of contaminants.

PROGRAMMATIC ACTION 1C: Provide incentives to landowners to modify agricultural or other land use practices that contribute to the input of contaminants into waterways.

RATIONALE: Reducing the inputs of contaminants into waterways from the lands with the greatest inputs would provide significant improvement in

water quality in streams and wetlands, as well as in the San Joaquin River and Bay-Delta.

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